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ABSTRACT

This study examined the differences between preservice and inservice teachers' perceptions of knowledge in instructional planning skills for teaching science in primary grades and identified the skills perceived as most knowledgeable and least knowledgeable by the two groups. Forty-one inservice and preservice African-American teachers from an early childhood program in a Midwestern urban university participated in the study. The perceptions were gathered using a five-point Likert-type scale on 10 instructional planning skills for teaching science. Multivariate analysis of variance was employed to examine the differences of perceptions across 10 specified skills in the 2 groups of teachers. Descriptive statistics were used to identify the skills perceived as least knowledgeable and most knowledgeable by the two groups. Results showed statistically significant differences between the two groups of teachers in their perceptions of the 10 skills of instructional planning for teaching science. Preservice teachers perceived that they had little knowledge in most of the skills. Inservice teachers perceived that they had considerable knowledge in the 10 skills. The findings of this study provide useful feedback to teacher education programs regarding the extent of knowledge and skills that preservice and inservice teachers will need to meet the demands of teaching science in primary grades. (Contains 38 references.) (Author/SM)

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Preservice and Inservice Teachers' Perceptions of Skills in Science Teaching for Primary Grades

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Paper presented at the annual meeting of the

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Abstract

This study aimed to examine the differences between preservice and inservice teachers' perceptions of knowledge in instructional planning skills for teaching science in primary grades and to identify the skills perceived as most knowledgeable and least knowledgeable by the two groups. Forty-one inservice and preservice African-American teachers from an early childhood program in a Mid-western urban university participated in this study. The perceptions were gathered using a five-point Likert type scale on 10 instructional planning skills for teaching science. Multivariate analysis of variance was employed to examine the differences of perceptions across the ten specified skills in the two groups of teachers. Descriptive statistics were used to identify the skills perceived as least knowledgeable and most knowledgeable by the two groups. Results showed statistically significant differences between the two groups of teachers in their perceptions of the ten skills of instructional planning for teaching science. Preservice teachers perceived that they had little knowledge in most of the skills while inservice teacher's perceived they had considerable knowledge in all of the skills. The findings of this study provide useful feedback to teacher education programs regarding the extent of knowledge and skills the pre-service and in-service teachers will need to meet the demands of teaching science in primary grades.

Pre-Service and In-Service Teachers' Perceptions of Skills in Science Teaching for Primary Grades

In the field of teaching, what teacher brings to the teaching learning environment largely accounts for his or her own world view which includes beliefs, attitudes, needs, knowledge, experiences and priorities (Calderhead & Robson, 1991; Clark & Peterson, 1986; Shulman, 1987; Tobin, 1993). One's self-perceived ability to perform a task is explained as the concept of efficacy (Bandura, 1977, 1986) emerged from social behavior research and it is further identified as that affects one's choice of activity, effort expended, perseverance in the face of failure, and feelings about performance. Efficacy has also been found to be subject specific; a person could feel highly efficacious in relation to one area or activity but incapable in other areas. Bandura (1986, 1993, 1997) explained that perception about one's performance contributes either to raising or failure of efficacy beliefs and adds to the feelings of mastery or incompetence. In the task of teaching, efficacy is seen as teacher's self- perceived ability to influence student performance and confidence (Pajares, 1992). Efficacy may influence teacher's activity, effort, and productivity (Ashton & Webb, 1986). As teacher decisions are associated with teacher conceptions, student teachers' beliefs are important (Harlen, 1992). According to Carter (1990), as cited by Skamp (1997), the teachers' disciplinary background, orientations, knowledge and beliefs influence their views and actions, about such matters as how they plan to implement content, the processes and content of their instructions, and the means the teachers use to communicate their own ideas and values about the content in teaching their students.

Research on pre-service teachers' perceptions of effective teaching suggests that students who enroll in their first or second year of teacher education programs are generally concerned

with instructional strategies which are more teacher centered (Marchant, 1988, 1992; Marchant & Bowers, 1988). Beginning teachers generally draw their perspectives from their academic background. Therefore coursework, field experiences and teacher preparation programs provide bases for most of their expectations and beliefs about teaching, unfortunately, which are often limited (Cochran, DeRuiter, & King, 1993; Griffen, 1989; Shannon, 1994). Beginning teachers often enter teaching with unrealistic optimism about what to expect and they are likely to have little resilience to failure (Weinstein, 1988). Gorrell and Dharmadasa (1989), in a study conducted with Sri Lankan teachers, found pre-service teachers exhibiting higher levels of self-efficacy than in-service teachers on many competencies associated with successful teaching. Instructional and planning behaviors (Veeman, 1984; Weinstein; 1988) instructional and communication behaviors (Adams, 1982; Weinstein, 1989) and (instructional) planning and (planning) materials (Shannon, Swetman, Barry, & vonEschenbach, 1996) were identified as being the most problematic areas for beginning teachers. On the other hand veteran teachers draw more from their experiential background (Shannon, et al., 1996). The past research indicates differences in perspectives between the pre-service and in-service teachers in the areas of instructional planning and planning materials, that are considered most essential for effective teaching.

Researchers have focused on particular areas related to teacher efficacy: specific content areas, efficacy of new versus experienced teachers, and teacher efficacy regarding students learning (Newman, 1997). Pajares (1996) argues that efficacy assessment not only be domain specific or content specific but also task specific and that skills required to successfully perform a task must be stated clearly and orderly for the subjects to effectively assess their confidence as they approach the task.

Gins and Watters (1996) who explored the experiences of two novice elementary teachers for factors related to self-efficacy and motivation to teach science found that by fostering and developing novice teachers' sense of self-efficacy in teaching science, the education systems are able to operate more effective science programs. The personal beliefs that teachers have about themselves and their ability to teach science require investigation, because teachers beliefs may influence their attitudes to science which may result in inappropriate science teaching behaviors (Gins & Watters, 1996; Riggs & Enochs, 1990). Therefore attempts to evaluate practicing teachers' motivation to teach by acquiring an understanding of their sense of self-efficacy and the identification of ways of developing self-efficacy are becoming increasingly important aspects of science education, research and the professional development of teachers (de Laat & Watters, 1995).

Above theoretical background necessitates a study of teacher perspectives on the specific component of instructional planning, which according to Adams (1982), Shannon, et al., (1996), Veeman (1984), and Weinstein (1988), is found to be the most problematic domain related to teaching. In this study, I examined the perceptions of preservice and inservice teachers' skills of instructional planning for teaching science in primary grades and the skills perceived as most knowledgeable and least knowledgeable by the two groups.

Method

The sample of this study consisted of 41 African American student teachers enrolled in a four- year early childhood program in a Mid-western urban university, including 25 preservice (third year undergraduate) and 16 inservice (graduate) teachers all of whom are females, 21 years and over in age. To obtain information regarding perceptions of instructional planning skills in teaching science, the instrument was developed based on A Need Assessment Instrument for

Designing and Evaluating Site-based Staff Development (Askins, Duncan, Thomas, & Tarro 1996). The instrument contained ten instructional planning skills for teaching science: 1. Developing instructional objectives that clearly communicate to learners, 2. Selecting appropriate subject matter to achieve instructional objectives, 3. Organizing and sequencing instruction to achieve instructional objectives, 4. Developing suitable activities to achieve instructional objectives, 5. Structuring lessons to include a variety of strategies to support learning within cognitive, affective and psychomotor domains, 6. Designing activities within the lesson that helps students to think about their own thinking, 7. Using effective methods of questioning, 8. Assessing students learning accurately, 9. Using hands-on approach to teaching and learning, and 10. Developing learning environments for children to construct their own knowledge.

The instrument was administered to the subjects prior to taking the primary science methods course. The subjects were asked to respond to the ten items, by indicating their level of knowledge regarding a particular science teaching skill, in the five-point Likert type scale, 1. "no knowledge," 2. "little knowledge," 3. "considerable knowledge," 4. "extensive knowledge," and 5. "expertise." The Cronbach Alpha coefficients of reliability estimates were for preservice teachers .96, for inservice teachers .96 and .97 for the total sample.

A multivariate analysis of variance (MANOVA) design was applied and analyses were performed to explore the differences in perceptions across the ten specified instructional planning skills between the two groups of teachers. Descriptive statistics were used to identify the skills that were perceived as least and most knowledgeable in each group.

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Results

The results of MANOVA tests showed statistically significant differences between the two groups: inservice teachers and preservice teachers, in their perceptions of instructional planning skills in teaching science at primary level, $F(1, 39) = 18.33$, $p = < .01$ (see Table 1).

Insert Table 1 about here

The data in Table 1 also indicate statistically significant within-subject main effects associated with the ten instructional planning skills, $F(9, 351) = 3.17$, $p = < .01$. The data presented in this Table further show statistically significant within-subject interaction effects associated with the two teacher groups and the ten instructional planning skills $F(9, 351) = 2.52$, $p = < .01$.

Means and standard deviations of the preservice and the inservice teachers' perceptions on ten skills of instructional planning in teaching science are reported in Table 2. The reported data show that the mean values of preservice teachers' perceived knowledge of instructional planning skills ranged from 2.40 ($SD = .91$) to 2.84 ($SD = .75$) and for the inservice teachers the mean values ranged from 3.25 ($SD = 1.06$) to 3.94 ($SD = .93$).

Insert Table 2 about here

Preservice teachers perceived "using hands-on approach to teaching and learning" as being the most knowledgeable instructional planning skill ($M = 2.84$, $SD = .75$). These teachers perceived "structuring lessons to include a variety of strategies to support learning within

cognitive, affective and psychomotor domains (M = 2.40, SD = .91)" and "organizing and sequencing instruction to achieve instructional objectives (M = 2.44, SD = .77)" as being the two least knowledgeable instructional planning skills. Inservice teachers' highest mean value is also for "using hands-on approach to teaching and learning (M = 3.94, SD = .93)." The instructional planning skill, "developing instructional objectives that clearly communicate to learners (M = 3.25, SD = 1.06)" and "designing activities within the lesson that help students think about their own thinking (M = 3.38, SD = 1.20)" are perceived as being the two least knowledgeable instructional planning skills by the inservice teachers. The preservice teachers have also perceived, "designing activities within the lesson that help students think about their own thinking (M = 2.76, SD = .78), " "using effective methods of questioning (M = 2.64, SD = .76)," " assessing students' learning accurately (M = 2.64, SD = .76)," and "developing learning environments for children to construct their own knowledge (M = 2.64, SD = .70) as being better knowledgeable than in the other skills. "Using effective methods of questioning (M = 3.81, SD = .91)," "selecting appropriate subject matter to achieve instructional objectives (M = 3.75, SD = .86)," " organizing and sequencing instruction to achieve instructional objectives (M = 3.75, SD = 1.06)," and "developing suitable activities to achieve instructional objectives (M = 3.75, SD = .93)" have also been perceived by the inservice teachers as being better knowledgeable than in the other skills.

Discussion

Results of the present study show statistically significant differences between preservice and inservice teachers' perceptions of instructional planning skills for teaching science. The mean values ranging from 2.40 to 2.84 indicate that the preservice teachers perceived they have little knowledge in all of the skills of instructional planning for teaching science at primary level.

The means ranging from 3.25 to 3.94 indicate that the inservice teachers perceived they have considerable knowledge in all of the ten skills of instructional planning for teaching science at primary level. It reveals that beginning teachers tend to evaluate their skills of instructional planning in a lower level than practicing teachers. These findings are consistent with Fuller (1969) that perceptions of teaching skills progress along a developmental continuum as teachers gain more experience. The mean values below 3.94 on five point scale regarding ten instructional planning skills of preservice and inservice teachers perceptions indicate that both groups are not highly confident about their skills of instructional planning for science teaching in primary grades. It supports the findings of Shannon, Swetman, Barry and vonEshenbach (1996), Veenman (1984), and Weinstein (1988) that teachers, pre-interns and interns consider instructional planning as being the most difficult area of teaching. Pontius (1998) stated that compared with other subjects, science is primarily a fact-based subject that contributes to the low efficacy in many preservice teachers. It suggests that, to be knowledgeable of content of the subject is more important in planning instructions for teaching science. It appears that preservice and inservice teachers, as they mostly have better experience only in pre-primary level, may have a low perception regarding their knowledge of instructional planning for teaching science at primary level.

Both groups of teachers who exhibit higher perception values for the instructional skill "using hands-on approach to teaching and learning" indicate that they feel confident of planning hands-on activities in teaching science. It is interesting to note that both skills the preservice teachers have perceived as least knowledgeable, "organizing and sequencing instruction to achieve instructional objectives" and "structuring lessons to include a variety of strategies to support learning within cognitive affective and psychomotor domains" are closely related to the

pedagogical knowledge. The fact that the inservice teachers who perceived "developing instructional objectives that clearly communicate to learners" as the least knowledgeable skill in instructional planning, reveals that they are not well confident about identifying exact instructional objectives. When the two groups are compared, the inservice teachers appear more confident of their skills of developing teaching strategies than the teachers yet preparing for the teaching profession. On the other hand, the preservice teachers' perception of "developing instructional objectives that clearly communicate to learners" as a better knowledgeable skill than "organizing and sequencing instruction to achieve instructional objectives" suggests that the beginning teachers are more concerned about how to teach than what to teach. Though with limited amount of experiences preservice teachers are confident of their ability to develop instructional objectives that clearly communicate to learners. However, Weinstein (1988) identified inexperience judgement as "unrealistic optimism". Also the finding that preservice teachers' perception of "designing activities within the lesson that helps students think about their own thinking" as one of the more knowledgeable instructional planning skills, as opposed to the inservice teachers' perception of it as one of the least knowledgeable skills, is consistent with Weinstein (1988).

Conclusion

The findings of this study offer insights into understanding more about inservice and preservice African American teacher's perceptions about instructional planning skills related to science teaching in primary grades. Teachers need support and training to develop their sense of efficacy when they attempt innovations in teaching. Inservice and preservice teachers need to be exposed to relevant teaching-learning activities to develop their knowledge base regarding skills of instructional planning for teaching science especially in primary science methods courses at

college levels. Gorrell and Capron (1988) found preservice teachers with low personal efficacy raised their efficacy beliefs after a combination of cognitive modeling and reflective task-oriented exercises, as opposed to those under a combination of direct instruction and reflection on self efficacy. As suggested by Tschannen-Moran, Hoy, and Hoy (1998), teachers need thorough understanding of the complexity of teaching tasks and help in breaking these down to allow them to focus on and improve in a manageable subset of skills.

To narrow the gap between preservice and inservice teachers, it is vital for beginning teachers to interact with experienced teachers and gain new perspectives about their strengths and weaknesses in instructional planning. It may help beginning teachers who have limited experience in teaching develop beliefs about their abilities to plan and teach a particular subject area successfully. Though the path to change is difficult, Grossman, Wilson and Shulman (1989) suggest prospective teachers to study subject matter related to content knowledge, substantive knowledge and syntactic knowledge reflecting their own beliefs about the subject matter. Planning joint sessions involving scientists, science educators and students provide the way to link content knowledge with teaching of science (Tobin, Roth, & Brush, 1995). Overall, it is a necessity to develop effective teacher education programs, especially at college levels to equip the minority preservice and inservice teachers with relevant knowledge and skills to meet the demands of science teaching in primary grades.

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Table 1

MANOVA Effects of the Instructional Planning Skills by the Teacher Groups: Preservice and Inservice

Analysis	Df	F
	Between-subjects	
Two teacher groups (A)	1	18.33**
Error (S/A)	39	(5.68)
	Within-subject	
Instruction planning skills (A)	9	3.17**
Instruction planning skills X Group	9	2.52**
Error	351	(0.21)

Note. Values enclosed in parentheses represent mean square errors

** $p < .01$

Table 2

Mean Scores and Standard Deviations of Preservice and Inservice Teachers' Perceptions for the Ten Instructional Planning Skills

Instructional planning skills	Preservice teachers		Inservice teachers	
	Mean	SD	Mean	SD
1. Developing instructional objectives that clearly communicate to learners	2.60	.71	3.25	1.06
2. Selecting appropriate subject matter to achieve instructional objectives	2.52	.82	3.75	.86
3. Organizing and sequencing instruction to achieve instructional objectives	2.44	.77	3.75	1.06
4. Developing suitable activities to achieve instructional objectives	2.56	.87	3.75	.93
5. Structuring lessons to include a variety of strategies to support learning within cognitive, affective, and psychomotor domain	2.40	.91	3.50	1.10
6. Designing activities within the lesson that helps students think about their own thinking	2.76	.78	3.38	1.20
7. Using effective methods of questioning	2.64	.76	3.81	.91
8. Assessing students' learning accurately	2.64	.76	3.63	.89
9. Using hands-on approach to teaching and learning	2.84	75	3.94	.93
10. Developing learning environments for children to construct their own knowledge	2.64	.70	3.63	.96

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